SCRRBA

Southern California Repeater and
Remote Base Association
P.O. Box 5967
Pasadena, California 91117

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In the Matter Of:	)	
	)	
Petition of the Land Mobile	)	
Communications Council to obtain	)	**RM-9267**
new spectrum for PMRS use, including the	)	
420 to 430 MHz and 440 to 450 MHz	)	
Amateur Service band.	)	

Re: Comments of the Southern California Repeater and Remote Base Association in opposition to portions of the Petition for Rulemaking by the Land Mobile Communications Council.

May 31, 1998

Summary.

The LMCC petition is seriously flawed. We will show that the Petition has failed to demonstrate why the LMCC cannot work within the Commissions present system of resource allocation to accomplish its members' goals. We will show that this petition is SERIOUSLY detrimental to the Amateur service, and that it will NOT serve the public good. We will show that the Petitioner has chosen to pick on a less economically powerful entity in hopes of taking away spectrum that we are already fully utilizing, and without incurring significant expense. We will show that displacing existing amateur operations and paying the fair cost of such spectral relocation will be very expensive, at best, and generally impractical. The Petition is silent on these costs. The Petitioner is silent on the cost to the American tax paying public of spectral relocation of the Government services the petitioner proposes to displace.

The Southern California Repeater and Remote Base Association (SCRRBA) is a voluntary association of owners and operators of Amateur Radio Service fixed and mobile relay stations operating primarily on the UHF and Microwave Frequency amateur bands. SCRRBA has provided frequency coordination for these activities since 1970. SCRRBA is a full member of the National Frequency Coordinators Council (NFCC). SCRRBA has actively participated in numerous Federal Communications Commission rule making proceedings pertinent to our activities.

SCRRBA currently maintains over 2,400 frequency coordination records. These data represent the activities of approximately 750 relay type amateur radio systems in Southern California. These systems operate on the UHF (420 MHz) and higher amateur frequency bands. These systems each have an average membership of about 45 amateurs. The largest of these systems has a membership exceeding 1,300.

SCRRBA is an active participant (usually the sponsor) in the amateur band planning process. We represent the fixed and mobile relay interests in regional band planning meetings. These meetings occur when the existing plans do not cover a desired activity, or when they need to be upgraded to match new or increased activities. These meetings are attended by representatives of ALL the amateur uses of the band within the geographical region. These band plans are adopted by unanimous consent of these representatives. These band plans cover activity in the Southern California geographical region. Whenever we adopt a new band plan for our region, we submit it to the American Radio Relay League, Inc. (ARRL), and the National Frequency Coordinators Council (NFCC), to be included in national band planning efforts.

The members of SCRRBA are clubs and individual amateurs who construct and operate mobile and fixed relay amateur systems. These systems generally are available for normal operation 24 hours a day. Their fixed relay equipment is generally constructed and operated to provide a communications (and data) link between fixed points. The points of communication for these fixed relay stations do not change in the normal course of system operation. The typical systems are constructed with equipment manufactured for the commercial communications industry. This equipment is then extensively modified for operation in the amateur band, and generally improved with devices developed experimentally. Our members use tools and equipment developed from a variety of sources. The experimenter amateurs often develop techniques and devices that can be adapted for use on our mobile relay and fixed relay systems.[1] These modifications result in system performance far above that of the original equipment.

Systems developed by our members are generally used for continuous on-going daily communications rather than the intermittent or random nature of HF communications more often associated with Amateur Radio operations. Various types of communications and control data are sent over these systems. The members of most systems are "control" operators who are able to configure their system to meet any particular operational need. The control systems built to do this are all of amateur design and manufacture. There are no commercial equivalents that could be adapted to our needs. These systems can become quite sophisticated and complex.[2] The experience we gain building and operating these systems allow us to have communications tools far superior to and far more flexible than any commercial system could ever be. We have the communications equipment in place. From long experience we know how to make our systems

[1] See the San Bernardino Microwave Society, Western States Weak Signal Society, North Texas Microwave Society, Mt Airy VHF Radio Club, etc

[2] See the Cactus Intertie System, the largest in the world.

reliable. We have these systems running continuously which also allows us to develop communications skills. These systems, and the tools and skills residing within our membership provide a huge resource of communications capability. This resource is regularly tapped to provide many different types of public service communications. This resource is of tremendous value in an emergency[3]. These Amateur Radio systems often have a service area that extends throughout the Southern California area and into neighboring states. This capability allows us to provide public service communications into and out of a disaster area when the commercial systems are not functioning[4]. These systems communicate within the region and into and out of the region on fixed point-to-point links.

The vast majority of the mobile relay and control stations coordinated by SCRRBA operate in the 440 to 450 MHz sub-band. Within this band, and in within our coordination service area of Southern California, there are 545 coordinated stations. These stations commonly operate as interconnected systems through the use of fixed relay (point to point) stations. This interconnection is generally accomplished in the 420-430 MHz sub-band. Within this band, and in within our service area of Southern California, there are over 1,200 coordination's, representing approximately 1,800 fixed relay stations. See Appendix 1 for additional information and an analysis of the fair replacement cost of such equipment.

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[3]Most commercial and public communications are disrupted or overloaded during most any type of emergency. When the emergency is as severe and widespread as the recent Northridge (Los Angeles) earthquake, Amateur radio is often the sole source of communications for officials and the public alike. Many of our members' systems were heavily used during the earthquake aftermath. Many operated nearly continuously for days.

[4]The telephone system was shut off to incoming calls from out of state for many days after the recent earthquake. The area shut off for the first day or two was nearly ten times that actually affected by the earthquake. This meant that relatives and officials in areas outside Southern California could not call in on the telephone to areas where there was no damage at all. Our members' systems handled hundreds of calls each from people all over the Southwest who could not call their relatives and friends in Southern California, an area of some 25 million people.

These systems and the members and owners of these systems are a huge resource of emergency communications capability. These same people and systems are also a huge resource of supplemental communications capability commonly used for official and or public support during any number of scheduled public events, from parades to off road desert races to marathons to beach cleanup events.

It has become a well known fact that the public communications services are generally overloaded at large public events. These services are also unable, or are inadequate to supply reliable communications in somewhat unusual locations such as the mountains, canyons, or the desert. The Southern California region, with a population of some 25 million citizens, is surrounded by mountains, with canyons, and by the deserts. The public communications services in these areas are generally fair to poor, and are immediately overloaded when any unusual event occurs. The public safety communications services, when they are working at full performance, supply service to public safety personnel in these areas, but no-one, except amateur radio operators, provides the public with communications services in these situations. A communication to a family that a citizen is "OK" and simply trapped by a road closed by a landslide, or mudslide, may seem trivial, but we submit it is NOT trivial to those directly involved in such an "occurrence". Amateur radio operators, AND their communications SYSTEMS, regularly provide such health and welfare communications.

Public safety communications services are generally adequate to handle the increased traffic generated at localized event, but are completely swamped whenever the event is widespread. This immediately limits their communications to emergency and critical safety matters. The

public communications facilities may or may not survive a widespread "event", but will NOT be able to handle the huge increase in traffic. The public communications services generally turn off portions of their systems, and long distance telephone access, as a traffic management tool.[5] This creates a public "health and welfare" communications void. The amateur radio operator, AND his communications SYSTEMS steps in to fill this void.

Public emergency support entities, from FEMA to the Red Cross regularly use amateur radio communications during the first hours or days of an "event" because, we are there, on the spot, and with the necessary communications skills and tools to handle whatever outages the "event" has created. The existing public safety systems, if they fully survived the "event", do not have the traffic capability to support these "outside" entities. Public communications services, whatever parts are working after an "event", will be completely overloaded. Amateur radio operators trained and ready, with their communications capabilities and systems, are an essential part of the National Communications Infrastructure.

PMRS operations are also an important part of the National Communications Infrastructure. The PMRS operations support the specific entity that licensed them and do not directly support any public communications needs, even in an "event" situation. PMRS communications services and users certainly have and will handle some public support communications in an "event" situation, but the task of the PMRS system is and must be the support of its licensed entity. Generally, in an "event" situation, this entity is very busy handing its own internal needs, and neither its personnel, not its radio system can reliably help the public. Amateur operators and their SYSTEMS have even helped PMRS licensees in an

[5] See footnotes 3,4 supra

event situation. Where the PMRS systems have failed due to the "event", most amateur systems and operators are flexible enough to work around any failure and continue communications.

The LMCC has petitioned the Commission to obtain 20 MHz of prime Amateur Service spectrum. The 144-148 MHz and 420-450 MHz Amateur Service bands can be construed as, to use the LMCC phrase, OUR "workhorse bands". The LMCC petition proposes to take away 49 PERCENT of the Amateur service spectrum between 30 and 900 MHz. The amateur service is required by statute to use frequencies above 222 MHz for Control and Auxiliary services. This proposal would eliminate 61 PERCENT of the spectrum between 222 and 900 MHz currently used for Repeater, Control and Auxiliary services. Within each Amateur system, the legal categories of operation, Control, Auxiliary, and in some cases, Repeater, are already completely Time Shared. Elimination of any one of these classes of service will render the remaining operations moot, as the associated system will be unable to function as a SYSTEM. The large interconnected systems discussed above cannot operate without the point to point connections, and no station, regardless of class of operation, is allowed to operate without proper methods of control. The amateur service is heavily dependent upon the 420-430 MHz and 440-450 MHz sub bands for these operations. This is not only our "workhorse band", it is the ONLY band below 900 MHz with legal spectrum for remote control and point to point services, and the only one with sufficient spectrum to accomplish efficient sharing of control, auxiliary and repeater operations. In this area, Southern California, there are thousands of stations actively using this spectrum every day. These numbers are the fixed and mobile relay stations alone, and they do not include the tens of thousands of amateurs who actively utilize these services each day.

The LMCC would take this workhorse spectrum for its members, and offers to "share" it with the amateur service on a secondary basis. This is a hollow and vacant offer. The petitioner is completely silent on methods of sharing this spectrum with the Amateur Service, while stating that "Amateur applications should remain secondary."[6] The petitioner clearly understands the issues facing sharing between similar services when one service is economically more powerful. The petitioner has already suffered great loss of spectrum to the CMRS, and states that:

> "The co-existence of PMRS and CMRS systems in a single allocation will inevitably lead to one result -- the eventual elimination of PMRS users on those bands."[7]

We concur, and state that, if this scenario occurs between two licensed services who have the same allocation level, any such shared spectrum between such similar services when one is clearly secondary by statute will result in the complete, total, and rapid elimination of the secondary user. Therefore, we state that the "offer" from the LMCC to "share" the 420-430 MHz and 440-450 MHz spectrum is hollow and vacant.[8]

The LMCC apparently believes the amateur spectrum of 420-430 MHz and 440-450 MHz to be lightly occupied and "of less importance"[9] and that the operations there can be casually dismissed without further consideration. This is evidenced by the petitioners' total failure to

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[6] Petition at 73
[7] Petition at 101
[8] Perhaps the LMCC would like this spectrum on a basis secondary to the Amateur service, and be required to resolve any and all interference to amateur operations.
[9] Petition at 73

supply any fact or data about the amateur occupancy of these sub-bands. We herein supply occupancy data for the Southern California region.[10]

The petitioner recognizes that there would be "a net constriction" in amateur service bands, and offers the hollow "bone" of 1390-1395 MHz and 1427-1432 MHz.[11] We submit that this offer is simply a cover for the real reason, that is it "too expensive" to develop equipment for this band.[12] If it is too expensive for the captains of industry the LMCC so proudly counts amongst it members, then it is clearly totally impractical for the Amateur service to utilize as any form of "replacement", or "like" spectrum.

The petitioner further states that the Amateur community could benefit from "advanced services ... equipment availability and technology..."[13]. This, too, is a hollow offer, for there must be spectrum on which to use these "benefits". After the LMCC community has taken over 49% of the amateur spectrum between 30 and 900 MHz, such a technological "boon" will be of little value. Without sufficient spectrum to use, the amateur community cannot develop uses for such advanced technology.

The Commission has converted substantial portions of previously PMRS spectrum to much more lucrative CMRS spectrum. The Commission has made it clear that the future spectrum utilization of PMRS is to be made through the CMRS format. The LMCC, instead of finding ways to make these decisions work for its members, has chosen to search for replacement spectrum where currently used equipment and techniques can be expanded. It is clear that

[10] see appendix 1, occupancy and replacement cost analysis
[11] Petition at 78
[12] Petition at 76 and 77

this search is organized to find spectrum where the current 25 kHz channelization scheme and current production equipment can be used. That this search should fall onto spectrum allocated to the amateur radio service is the result of a misguided effort to find spectrum occupied by a less economically powerful service. This attempt is seriously flawed in numerous areas.

The LMCC would have us believe that they have completely run out of available spectrum to use. The LMCC states that there will be an enormous growth in PMRS spectrum use over the next 25 years.[14] Apparently, the LMCC membership cannot determine how to better use the available resources to accommodate this growth since they are turning to the Commission to obtain more spectrum. We contend that what they actually want is more spectrum on which to utilize the same technology they are presently using, AND they want this spectrum to be adjacent to their "workhorse band" so their equipment costs are minimized.[15] Their premises are given away in several statements, notably their argument that "refarming will provide limited relief"[16], their stated concern that some higher spectrum is "inherently more costly",[17] and that there is "no PMRS equipment (presently) available" (for the higher frequency band discussed).[18]

The petitioner discusses "refarming" briefly,[19] but fails to show why the PMRS licensees cannot take the initiative, and convert whole groups of frequencies to 12.5 kHz (or even 6.25 kHz) operation immediately. This would provide the immediate relief the petitioner seeks,

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[13] Petition at 73
[14] Petition at 67, and others
[15] Petition at 68-73
[16] Petition section 3B, 38 through 43
[17] Petition at 76

and without displacing other spectrum users, and with no regulatory changes required. The hidden truth here is that the petitioner does not WANT to take such initiative. Converting existing 25 kHz spaced facilities could be an expense for the existing users, whereas placing new PMRS users on NEW PMRS spectrum will only cost the NEW user the basic expense for presently available equipment. We contend that the petitioner has carefully omitted this entire scenario.

The petitioner could take the initiative and work out a schedule for immediate conversion of existing spectrum to 12.5 kHz, or even 6.25 kHz, by passing on all or part of the cost of covering existing users to the new users. This new user is the one who will benefit from such increased spectrum availability. We contend that if the cited spectrum congestion is such a problem for existing users, why have those users not taken the initiative to COLLECTIVELY convert immediately to 12.5 kHz or even 6.25 kHz? The Airport and Harbor operations held up as example by the Petitioner are perfect examples of users who can IMMEDIATELY benefit from converting their own facilities to narrower bandwidths, and obtain licensing for the new channels thereby created. This collective conversion would alleviate the expressed (valid) concern of the petitioner that it is undesirable to mix emission bandwidths.[20]

The petitioner has failed to supply data showing why regulatory changes to provide improved access to the existing PMRS allocations at 470-512 MHz cannot be made. We suggest that immediate access be authorized for PMRS use of any channel (14-20) not presently licensed for analog TV, or freshly allocated for HDTV use. We suggest that this spectrum be made

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[18] Petition at 77
[19] Petition at 31, 38-41
[20] Petition at 39

available on that basis throughout the country and not just in a very few cities. We further suggest that no new television broadcast licenses be granted in the 470-512 MHz spectrum. The petitioner states that most of the PMRS licensees need only a small service area.[21] We suggest that such low power PMRS use of frequencies within the 470-512 MHz spectrum can be accomplished without interference to adjacent (TV) channel television reception. The entire Los Angeles Harbor operations which are held up to example by the petitioner could be accommodated in a very small portion of one TV channel allocation with little or no interference to television reception.[22]

The petitioner has failed to supply data showing why the present allocations at 470-512 MHz cannot immediately be converted to 12.5 kHz channel spacing. We suggest that a relaxation of the very strict geographical limits on non TV broadcast licensing in this band will provide room for substantial PMRS growth.

The Commission has recently re-allocated TV channels 60-69 for CMRS and public safety use. The petitioner is silent on this matter even though a significant percentage of the LMCC membership is public safety. We realize that all of these frequencies cannot be made immediately available. We suggest that in areas of the country where no analog or HD television station is authorized operation, that public safety be authorized to begin operations immediately. We suggest that there is more than sufficient engineering data available to determine the needed geographical spacing and power restrictions to allow public safety operation on first adjacent (TV) channels. The public safety stations certainly will have much less power, and much less interference potential than a HD television transmitter, and,

[21] Petition at 12

therefore, should NOT be subjected to the same on channel and adjacent channel spacing limitations as are applied to television stations.

The petitioner is silent on the matter of resource allocation within CMRS. We contend that it should be possible for PMRS licensees to obtain some form of agreement, or "license", to operate some of their own facilities within the overall scheme of a CMRS license. Such agreement and equipment operation will alleviate the concerns of the LMCC that CMRS licensees will not construct adequate facilities to support the more specialized dispatch loading requirements of PMRS operations.[23] It would appear such silence is based upon the potential COST of such "license", and not its viability.

Conclusions

The petitioner is improperly placing the Amateur Service in the middle of the ongoing PMRS vs. CMRS allocation arguments. The Commission decides resource allocation (frequency band assignments). Involving the Amateur Service in a commercial resource allocation battle can only result in serious harm to the Amateur Service, unless the Commission moves quickly and decisively to halt such actions.

We are already seeing the results of this CMRS vs. PMRS argument in another piece of spectrum that used to be allocated to the amateur service. The Commission removed 220-222 MHz from the amateur service some 5 years ago, and made that spectrum available to the CMRS/PMRS. At this time, 5 years later, the information we see shows that the actual

[22] Petition at 16

utilization on that band is LESS than 10 percent of what it was while it was in the amateur service! If the amateur use of this band had been allowed to continue to grow, the current amateur occupancy would probably be several times what it was 5 years ago, not one tenth, as it is presently. We fail to see how this has served the public.

The LMCC petition is flawed. The LMCC has shown a need for more facilities. The LMCC has NOT shown that those facilities MUST be placed on new spectrum allocations. The LMCC has NOT shown that its members are making the maximum use of their presently allocated spectrum. The LMCC has NOT shown that their members are working vigorously (or at all, for that matter) to improve their spectrum efficiency. The Commission presently encourages such spectral improvements, and requires them in the measured future. The LMCC appears to give these rules only a passing glance in their haste to take our spectrum!

The LMCC is totally silent on the cost of their proposal. These costs, if the petition is implemented as stated, will be borne by the Amateur Service, presently the secondary user of this spectrum, and by the federal government, Department of Defense, the primary user of this spectrum. This lack of consideration of any cost but their own hardly qualifies this petition as well thought out, much less for serious consideration.

We, the Amateur Service, have no captains of industry to support us nor provide our defense. We count on the fairness and support of the Commission to protect us from loss of spectrum, and loss of allocation status. We urgently request that the Commission DENY the portions of

[23] Petition 52-66

the LMCC petition applicable to the 420 to 430 MHz and 440 to 450 MHz Amateur Service bands.

Respectfully submitted,

Southern California Repeater and Remote Base Association

By:

M. Robin Critchell,

Senior Coordinator

Attached:

Appendix 1

SCRRBA
Southern California Repeater and
Remote Base Association
P.O. Box 5967
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APPENDIX 1

ANALYSIS OF AMATEUR USAGE IN THE 420-430 MHZ AND 440 TO 450 MHZ AMATEUR SERVICE BANDS WITHIN THE SOUTHERN CALIFORNIA COORDINATION REGION, AND APPLICABLE COSTS TO ACCOMPLISH A BAND CHANGE

Section 1:

SCRRBA coordination database listings, Southern California region.

440-450 MHz
545 "mobile relays", about 75% of which are control links, and not just repeaters.

420-430 MHz
1250 coordinations representing about 1800 transmitter/receiver pairs, all fixed links.

420-430 MHz, Amateur NTSC television.
One shared assignment only. This frequency is used for public service/event activities, usually a short haul portable service. There are approximately 150 stations operable on this frequency (426.250 MHz)

The above numbers represent fixed installations of mobile relay, fixed relay, and control stations listed the SCRRBA coordination database. Our database listings are sufficiently current and accurate to provide very close working numbers.

We estimate that the AVERAGE membership on each of the 545 mobile relays is 45. Some systems are much smaller, and there are quite a number with MUCH larger numbers, quite a number are well above 200 members. We estimate that it is typical that any ONE member of any of these systems has a home station radio, at least one mobile, and often two portables. Many of the amateurs who have been active on the band for a number of years have 5 or 6 mobiles and portables.

It should be noted here that this represents data and activity in the Southern California region, where the general population is very mobile, where families typically have at least one automobile per licensed driver, often more. Each one of these automobiles owned by a licensed amateur is likely to have a mobile station installed.[24] Hand held portable stations are also very commonly used, as this region has radio systems with some of the best coverage performance in the world. Often, entire families are licensed, and use hand held radios to communicate while going about their normal daily business, or on the very common weekend outing activity. These portables are utilized both in conjunction with a communications relay system, and independently, depending on the need at the time of communication.

[24] When reviewing the mobile statistics, please remember that this is Southern California, the automotive capital of the country, where houses with only a two car garage are considered "automotively challenged"

The statistical analysis of this data yields the following average values:

545 mobile relay stations
1.5 complete point to point "duplex" links (fixed relays) per mobile relay station
45 members of each mobile relay station,
Each member has one fixed (base) station,
Each member has 1.5 mobile stations,
Each member has 1.5 portable stations.

A single theoretical system has one mobile relay, 3 link ends, 45 base stations, 67 mobiles, and 67 handheld stations.

Section 2:
Cost estimates to move the present Amateur Service infrastructure to another band.

The Amateur Service allocations that could accommodate such a large number of stations are few. By statute, these operations must remain above 222 MHz.

222-225 MHz.
This band is already over populated in this region, having recently suffered a loss of 40% of the available band. Even if this band were empty, it could not handle a significant portion of the stations presently occupying 420-430 and 440-450 MHz.

430-440 MHz.
This sub-band is restricted in several ways. The segments 431-433 MHz, and 435-438 MHz are restricted by statute from repeater and auxiliary operations. Furthermore, the sub-band is already filled with digital, weak signal, satellite and amateur television operations. It cannot absorb more than a minute portion of the present activity in the 420-430 and 440-450 MHz sub-bands.

902-928 MHz.
This band should but cannot, accommodate a major portion of the stations occupying the 420-430, 440-450 MHz. The amateur allocation on this band is third non-government, and fourth including government operations, and has a lower layer, the Part 15 allocation. Each of the licensed layers is active in this region, and the licensed users are expanding their operations continuously. Just these licensed users have forced all amateur relay operations to the outer MHz at the top and bottom of the band, and with recent regulatory changes, the top MHz will have to be vacated by amateurs quite soon. The bottom layer, the Part 15, is the worst problem for this band. Virtually unlimited quantities of unlicensed equipment are operating on this band already, and more is being sold every day. Much of this equipment is either co-, or adjacent located to amateur operations. The simple quantity of this Part 15 equipment renders the band useless for any serious amateur operation. The strong presence of licensed users renders the band unusable for most amateurs. The net result is that significant amateur use of this band is essentially impossible.

1.24-1.30 GHz.
This band already is significantly occupied in this region with 5 television repeaters and, 180 mobile and fixed relays. It is possible, with a major re-assignment plan and much loss of flexibility to accommodate much of the 420-430 MHz and 440-540 MHz activity within this band. It is a documented fact that mobile and portable coverage on this band is quite significantly less than the coverage from an identical facility on the 400 MHz band. It is a documented fact that the maximum usable point to point path length for a fixed relay is much less than from an identical facility operating in the 400 MHz band.

2.30-2.31, 2.39-2.45 GHz.
This badly segmented band is already rapidly filling up with shorter haul point to point fixed relays and amateur television operations. There is some room left for some of the services presently occupying 420-430 MHz and 440-450 MHz, but with much more limited coverage and distance capability, and at a higher cost.

Analysis:

The following analysis is based on the necessary presumption that a new service must pay the relocation costs to displace an existing service, and the new facilities must provide substantially equal service to the that which the system had before displacement. It is presumed that the new service will commercially contract for these technical services. It is patently unfair to consider that the amateurs involved should donate their time, labor and expertise AGAIN, after having done so to construct their system in the first place.

Analysis of the above data shows that the 1.24-1.30 GHz band to be the only one which could accommodate moving the activities off of 420-430 and 440-450 MHz. The equipment and antennas are not compatible, and must be completely replaced. The mobile coverage performance is significantly less, requiring more stations and more fixed relay equipment to accomplish the same mobile coverage.

Task:
Replace the mobile relay transmitter, power amplifier, receiver, duplexer, circulator, filter cavity, preamplifier, antenna and in half the cases, the feedline. Supply the engineering to interface this equipment to the existing controller. Remanufacture the installation in the equipment rack as needed to accommodate the new equipment that undoubtedly will NOT fit in the space assigned to the equipment it is replacing. Supply the installation manpower to drive to the site, and install AND INTERFACE all the equipment, make it work properly.

We estimate the cost for doing all this, for JUST the mobile relay will very nearly approach $25,000.

Task:
Provide all the same services as above to replace the point to point equipment. The added task will be to supply new antennas designed for point to point service, with the attendant added costs of site rent for dish class antennas, some of which will require re-working the support structure to accommodate dish antennas.

We estimating the installed cost of one end of a duplex link is $15,000, average.

Task:
Do system engineering to determine how to replace the lost mobile coverage, and the added relay point needed for the point to point service. It should be noted that the average path length on 420 MHz in this region is about 70 miles, with some 20% of the active paths exceeding 110 miles in length, with about 5 % exceeding 135 miles in length. Supply and install this additional equipment, and pay the additional site rental costs.

Estimating the cost of these added needs is very difficult. So much is determined by the case by case facts. We estimate that the fixed equipment costs could easily DOUBLE for this theoretical statistical system we are using to make this analysis, and for any system which has inter-regional links, the cost could easily be triple or more. Any system whose mobile relay is presently serving operations on a region wide basis will require quite a lot of additional equipment simply to maintain its present service

area. We estimate that very approximately 40% of the systems in this region are operated under a "wide area" coverage designation.

The additional service and equipment needed will average out to cost additionally approximately equal to the cost of each mobile relay, and approximately an additional 0.75 times the cost of each point to point end station.

Task:
Replace each home station, mobile station and hand held station belonging to the members of these systems.

Such replacement equipment is not currently available. We estimate the average cost, in the long run, after small quantity manufacturing costs, will be approximately $ 600 per unit.

The equipment needed to accomplish the move to 1.2 GHz is NOT AVAILABLE. Relay grade transmitters, receivers, antennas, circulators, etc., are not manufactured for this band. It will be necessary to cause such equipment to be manufactured.

Summary:

One theoretical system has one mobile relay, 3 link ends, 45 base stations, 67 mobiles, and 67 handheld stations.

$70,000 for the fixed equipment without factoring the 1.0 coverage replacement factor, plus 0.75 times each link "end.

$107,400 for the "members" equipment.

Summary total for the Southern California region:

$ 100 MILLION dollars, Basic costs only.

$ 50 MILLION dollars MINIMUM additional costs to replace lost performance.